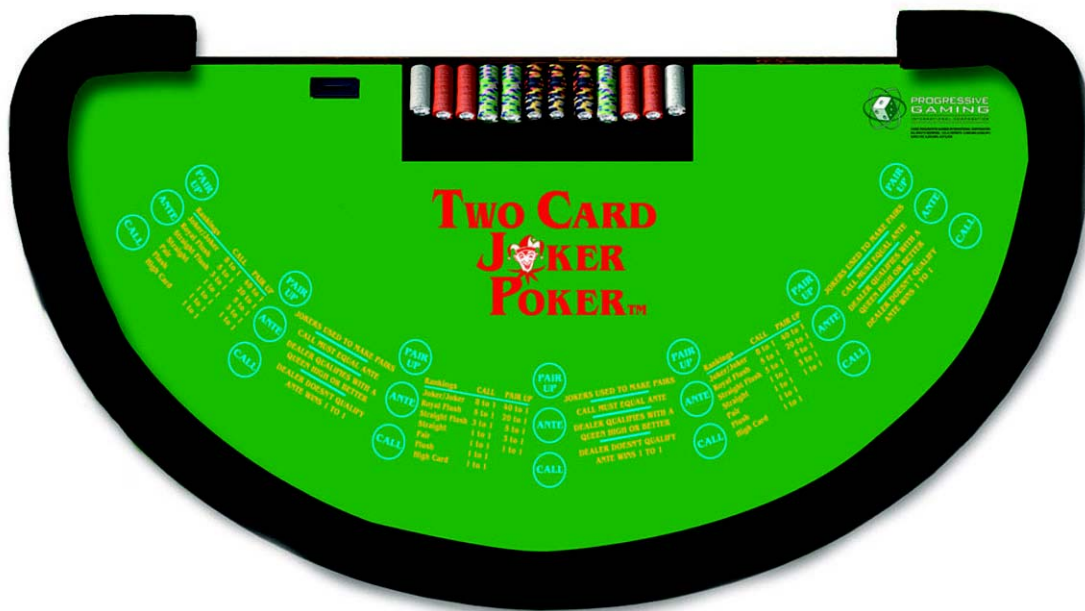


TWO CARD JOKER POKER™



User Manual with Mathematical Analysis

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Two Card Joker Poker™

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About This Manual

This manual describes the basic procedures to deal and play the TWO CARD JOKER POKER table game and assumes Dealers are familiar with standard poker rules.

This manual is intended for casino operators and employees, regulatory agencies, and independent governing bodies. Operator policy and internal control procedures for processing and paying jackpots take precedence over the procedures in this manual.

PGIC recommendations, such as hand motions, are to ensure clarity in game play and betting requirements. However, management **may alter** the procedures to suit in-house policies.

Establishing Limits on Bets and Aggregate Payouts

Casino management may choose to adhere to the following:

- Define and post separate **minimum and maximum wagering limits** for both the base game and side bet.
- Define and post for Pair Up (side bet) wagers only an **aggregate limit for payouts** (maximum allowed total payout to winning Players wagering on the Pair Up side bet, during a single round of play). Posting an aggregate limit protects your establishment from excessive liability in any one round of play, while allowing the Player a wider range of betting options, subject to posted aggregate limits.

Document Revision History

Revision	Description
Rev A	Added two Pair Up side wager paytables (TCJP13 and TCJP14) Corrected page numbering starting with page 8

Reference Documentation

Documentation for all PGIC products is available on the PGIC extranet at:

<https://extranet.progressivegaming.net>

Contact Information

Contact PGIC Customer Service if you have questions or comments about this document or any other PGIC product.

Post: Customer Service, 920 Pilot Road, Las Vegas, NV 89119

Phone: +1 800 798 1942 (toll free) or +1 702 798 1942

Fax: +1 702 263 2834

E-mail: 800Service@pgicorp.net

Web: www.progressivegaming.net

Recommended Game Procedures

Overview

TWO CARD JOKER POKER is a casino table game played with one standard 52-card deck plus two Jokers. In TWO CARD JOKER POKER, one or more Players play against the house Dealer. Players may begin by placing a wager in the spot marked “Ante” in order to receive a two-card hand. Then Players either Fold or Call by placing an additional wager in the spot marked “Call.”

The Dealer also receives two cards and requires a hand of “Queen High” or better to qualify. The object for the Player is to hold a two-card poker hand with a value higher than the Dealer’s qualifying hand (Queen High or better).

Players also have the option to place a side bet wager at the beginning of the game on the spot marked “Pair Up.” The Pair Up side bet is played against the posted payable and does not interact with Player and Dealer comparing hands on the Ante and Call bets.



Players may place a wager on the Pair Up only, the Ante wager only, or wager on both.

TWO CARD JOKER POKER is designed to be played on (but not limited to) a traditional size Blackjack table with custom designed felt, as shown in [Figure 1](#).

Figure 1 TWO CARD JOKER POKER table



Graphic subject to change.

Game Procedure Steps

Step 1: Initial Wagers

Players may begin by placing wagers in the spot marked “Ante.” See [Figure 2](#).

At the same time, Players have an option to place a Pair Up (side bet) wager. The side bet plays against the posted payable and does not interact with Player and Dealer comparing hands for best poker rating.



Players may place a wager on the Pair Up only, the Ante wager only, or wager on both.

Casino management is responsible for establishing and posting both base game and side bet minimum/maximum limits. See [“Establishing Limits on Bets and Aggregate Payouts”](#) on [page 1](#).

Figure 2 TWO CARD JOKER POKER bet spot on the table

Rankings	CALL	PAIR UP
Joker/Joker	8 to 1	40 to 1
Royal Flush	5 to 1	20 to 1
Straight Flush	3 to 1	5 to 1
Straight	1 to 1	3 to 1
Pair	1 to 1	1 to 1
Flush	1 to 1	
High Card	1 to 1	

PAIR UP
ANTE
CALL

JOKERS USED TO MAKE PAIRS
CALL MUST EQUAL ANTE
DEALER QUALIFIES WITH A QUEEN HIGH OR BETTER
DEALER DOESN'T QUALIFY ANTE WINS 1 TO 1

Step 2: Dealing the Hands

The Dealer announces “All bets down; no more bets” prior to the delivery of the cards. The Dealer then verbally acknowledges those Players who have NOT made the Pair Up wager (Ex: “No Pair Up, positions 2, 3, and 5”).

The Dealer shuffles, cuts, and proceeds to deal by hand, or delivers via an automatic shuffling machine (or by shoe, depending on regulatory requirements), a two-card hand face down to each player, then dealer, accordingly:

If dealing by hand:

- Shuffles and cuts, in accordance with in-house policies and procedures, then deals the cards one at a time.
- Delivers one card face down to each Player beginning to the Dealer’s left.
- Delivers one card face down and places it on the layout in the Dealer’s work area.

- d. Delivers second card face down to each player to the right of the player's wager.
- e. Fans each player's hand, slightly exposing one corner of each card.
- f. Delivers a second card face down and places it on layout adjacent to the first card in the Dealer's work area.
- g. Places the remaining cards from the deck in the discard rack.
- h. Places the index finger lightly on top of the hand to ensure game security and integrity.

If using an automatic shuffling machine:

- a. Removes the cards from the tray with the right hand.
- b. Delivers the cards face down to each Player beginning to the Dealer's left.
- c. Places each hand to the right of the Player's wager.
- d. Fans each hand slightly exposing one corner of each hand.
- e. Delivers the cards and places it on the layout in the Dealer's work area.
- f. Places the index finger lightly on top of the hand to ensure game security and integrity.
- g. Removes remaining cards from the shuffler and places them in the discard rack.

Step 3: Players Fold or Call

Players review their two-card hands and decide to do one of the following without interaction or communication with other Players:

- "Fold" by discarding their two-card hand and forfeiting the Ante wager.
- or
- "Call" by placing a wager equal to the amount of the Ante wager in the Call spot.

Step 4: Settling the Hands**A. Settling Folded Hand and/or Pair Up Wager**

The Dealer, once each Player has decided to fold or call, settles each folded hand and/or Pair Up wager individually. Acting in order from right to left, the Dealer reveals each folded hand and/or Pair Up hand to ensure there is or is not a winning possibility. Before moving to the next hand, the Dealer must collect the forfeited wager(s), pay any winning Pair Up wager, and then lock the cards from that Player in the discard rack. The Pair Up wager is paid according to the following payable:

Table 1 Pair Up side wager payable

Hand Type	TCJP1	TCJP2	TCJP3	TCJP4	TCJP5	TCJP6	TCJP7
Pair of Jokers	40 to 1	50 to 1	50 to 1	40 to 1	60 to 1	50 to 1	40 to 1
Royal Flush	20 to 1	25 to 1	35 to 1	25 to 1	30 to 1	30 to 1	30 to 1
Straight Flush	5 to 1	6 to 1	5 to 1	6 to 1	5 to 1	5 to 1	5 to 1
Straight	3 to 1	2.5 to 1	2.5 to 1	2.5 to 1	2.5 to 1	2.5 to 1	2.5 to 1
Pair	1 to 1	1 to 1	1 to 1	1 to 1	1 to 1	1 to 1	1 to 1
Flush	N/A	N/A	N/A	N/A	N/A	N/A	N/A
House Advantage	2.096%	2.096%	2.655%	2.795%	3.354%	4.053%	4.752%
Hit Frequency (1 in ~)	3.66	3.66	3.66	3.66	3.66	3.66	3.66

Hand Type	TCJP8	TCJP9	TCJP10	TCJP11	TCJP12	TCJP13	TCJP14
Pair of Jokers	50 to 1	40 to 1	40 to 1	40 to 1	50 to 1	40 to 1	35 to 1
Royal Flush	25 to 1	30 to 1	20 to 1	30 to 1	30 to 1	10 to 1	15 to 1
Straight Flush	4 to 1	4 to 1	5 to 1	5 to 1	3 to 1	5 to 1	4 to 1
Straight	3 to 1	3 to 1	2.5 to 1	1 to 1	1.5 to 1	3 to 1	3 to 1
Pair	1 to 1	1 to 1	1 to 1	1 to 1	1 to 1	1 to 1	1 to 1
Flush	N/A	N/A	N/A	Push	Push	N/A	N/A
House Advantage	3.354%	2.655%	7.547%	2.935%	3.494%	4.89%	7.917%
Hit Frequency (1 in ~)	3.66	3.66	3.66	2.20*	2.20*	3.66	3.66

*Push hands on
Flush included.



On every round of play, the Dealer must turn over the cards for any hand on which a Player has wagered an Ante or Pair Up wager.

B. Settling Ante Wager and/or Call Wager

The Dealer turns his two-card hand face up and arranges his hand from highest card value to lowest. Starting to the Dealer's right, the Dealer turns-over the Player's two-card hand and compares it with the Dealer's hand.

The Dealer's hand must qualify with a Queen or higher:

- If the Dealer does not qualify, the Player's Ante is paid even money. The Dealer and Player push on the Call bet.
- If the Dealer does qualify and –
 - The Dealer has a higher two-card poker ranking hand than the Player, the Player loses both Ante and Call wagers.
 - The Dealer has a lower two-card poker ranking hand than the Player, the Player is paid equal money on the Ante and is paid on the Call wager according to the following payable:





















Table 2 Call wager payable (paid on winning Call wager if dealer qualifies)

Hand Type	Odds
Pair of Jokers	8 to 1
Royal Flush	5 to 1
Straight Flush	3 to 1
Straight or less	1 to 1

- The Dealer and the Player tie; Dealer and Player push on all wagers.

C. Sample Hands and Their Settlement:

Table 3 Sample hand resolutions (the resolution columns are in units)

Player's Hand	Dealer's Hand	Player Action	Ante Resolution	Call Resolution
 	 	Call	Pays 1	Pays 1
 	 	Call	Pays 1	Push
 	 	Call	Loses	Loses
 	 	Call	Pays 1	Pays 3
 	 	Fold	Loses	N/A

The Dealer settles each hand individually. The Dealer pays or takes the wager(s) and then collect the cards and locks them in the discard rack. After settling all the Players' wagers, the Dealer collects his own cards and places them in the discard rack.



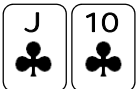

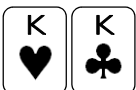





The Dealer must collect the cards in order and place them in the discard rack in such a way that they can be readily arranged to reconstruct each hand in the event of a question or dispute.

Poker Rankings

For both Players and Dealer, each card is ranked according to its poker face value (i.e. two, three, four, etc., up to Ace), while all suits are equivalent. As TWO CARD JOKER POKER is a two-card game of poker, the hand rankings are slightly modified with respect to traditional poker. Jokers are used only to complete pairs, with a pair of Jokers the highest hand. The following table lists the TWO CARD JOKER POKER hand rankings from best (Pair of Jokers) to worst (High Card).

Table 4 TWO CARD JOKER POKER hand ranking examples

Hand Type	Example
Pair of Jokers	
Royal Flush	
Straight Flush	
Straight	
Pair	 or 
Flush	
High Card	



A Straight beats a Pair and a Pair beats a Flush. Hands like Four of a Kind, Full House, and Two Pair are not available in this game.

Mathematical Analysis

Player's Basic Strategy and House Advantage

It should be clear that, since all cards come from the same deck, the Player's and the Dealer's hands are not independent. Thus, the proper method of analysis requires that, for each possible Player hand, the conditional probabilities of obtaining each possible Dealer hand must be reassessed.

In general, there are ${}_{54}C_2 = 1,431$ ways of randomly selecting two cards from a pool of 54 distinct cards for the Player. The following table shows the results of the combinatorial routine written to cycle through each possible set of two cards and rank them:

Table A.1 Combinatorial Analysis of TWO CARD JOKER POKER hands

Hand Type	Combinations
Two Jokers	1
Royal Flush	4
Straight Flush	48
Straight	156
Pair	182
Flush	260
Nothing	780
Total	1431

Player's Optimal Strategy

This strategy is a function of the two cards in the Player's hand only (since neither of the Dealer's cards are face-up). This method needs to correctly account for the dependent nature of the Player's and Dealer's hands. For example, if the Player holds two fives, the Dealer's chance of also having a pair of fives is predictably less. Other examples of this effect are not as obvious but are included since they have substantial effects on the optimal strategy and the associated house advantage.

To accommodate this effect, computer code was written to determine the optimal strategy for a given two-card Player hand. A specific combination of a Player's two cards has ${}_{54}C_2 = 1,326$ possible ensuing Dealer's hands. To determine the value of making a Call wager, each of these combinations is cycled through, ranked, compared to the Player's hand, and resolved to determine the outcome (assuming the Player made the Call wager). The results are saved in a cumulative fashion. The cumulative expected outcome from playing against each of the 1,326 possible Dealer's hands is finally normalized to determine the expected outcome from

Calling. This is compared to the expected outcome from folding, and the greater value is chosen as the correct play.

Performing the aforementioned calculation yields the optimal strategy, shown below, for any possible condition the Player may face.

OPTIMAL STRATEGY

- Call with a hand of Q-5 or better;
- Fold otherwise.



A Player using the optimal strategy calls approximately 67% of hands.

Adopting this strategy, the Player's expectation is -0.0315 units per Ante wager. **Hence, the theoretical house advantage against the optimal Player is 3.15% of the Ante.** It is almost assured that the observed house advantage is slightly more than the theoretical figure because individuals are unlikely to play the game at an expert level.

A reliable estimate of the volatility of TWO CARD JOKER POKER is obtained through the standard deviation per wager. The variance can be obtained by taking the product of each probability of outcome and the associated quantity $\{\text{actual outcome} - \text{expected outcome}\}^2$ for that outcome. The standard deviation per hand is then calculated as the square root of the variance.

Based on the payoff schedule and the probabilities of achieving each type of hand, assuming optimal strategy via the combinatorial code described earlier, we obtain a standard deviation per hand of roughly 1.7 units for each unit of Ante wagered.

The casino win for representative numbers of hands may be constructed as follows. For a number of hands N , the estimated Player's loss (hence, casino win) is the product of N and the Player's expectation. The standard deviation of the Player's loss is the product of $N^{1/2}$ and the Player's one hand standard deviation.

Pair Up Side Wager

TWO CARD JOKER POKER also offers an optional Pair Up side wager with the following possible paytables based on the Player's two dealt cards.

Table A.2 Pair Up side wager paytable

Hand Type	TCJP1	TCJP2	TCJP3	TCJP4	TCJP5	TCJP6	TCJP7
Pair of Jokers	40 to 1	50 to 1	50 to 1	40 to 1	60 to 1	50 to 1	40 to 1
Royal Flush	20 to 1	25 to 1	35 to 1	25 to 1	30 to 1	30 to 1	30 to 1
Straight Flush	5 to 1	6 to 1	5 to 1	6 to 1	5 to 1	5 to 1	5 to 1
Straight	3 to 1	2.5 to 1	2.5 to 1	2.5 to 1	2.5 to 1	2.5 to 1	2.5 to 1
Pair	1 to 1	1 to 1	1 to 1	1 to 1	1 to 1	1 to 1	1 to 1
Flush	N/A	N/A	N/A	N/A	N/A	N/A	N/A
House Advantage	2.096%	2.096%	2.655%	2.795%	3.354%	4.053%	4.752%
Hit Frequency (1 in ~)	3.66	3.66	3.66	3.66	3.66	3.66	3.66

Hand Type	TCJP8	TCJP9	TCJP10	TCJP11	TCJP12	TCJP13	TCJP14
Pair of Jokers	50 to 1	40 to 1	40 to 1	40 to 1	50 to 1	40 to 1	35 to 1
Royal Flush	25 to 1	30 to 1	20 to 1	30 to 1	30 to 1	10 to 1	15 to 1
Straight Flush	4 to 1	4 to 1	5 to 1	5 to 1	3 to 1	5 to 1	4 to 1
Straight	3 to 1	3 to 1	2.5 to 1	1 to 1	1.5 to 1	3 to 1	3 to 1
Pair	1 to 1	1 to 1	1 to 1	1 to 1	1 to 1	1 to 1	1 to 1
Flush	N/A	N/A	N/A	Push	Push	N/A	N/A
House Advantage	3.354%	2.655%	7.547%	2.935%	3.494%	4.89%	7.917%
Hit Frequency (1 in ~)	3.66	3.66	3.66	2.20*	2.20*	3.66	3.66

*Push hands on
Flush included.

Estimate of Hold

Though the Player's expectation, hence casino advantage, is calculated via mathematics, the same is not true of the casino hold. There is no available mathematical formula with which to derive casino hold. The casino hold is a function of many variables, several of which are not subject to objective analysis. These subjective variables include Player proficiency, the popularity of the game, perceived customer benefits from the game, and casino factors including placement of the game, number of available such games locally, table limits on the game, shifts during which the game is open, etc.

Given the above discussion of the uncertainty of a hold estimate, the hold of TWO CARD JOKER POKER is likely to be 20% to 30%.

Glossary

Ante wager	First wager a Player places to receive cards for that hand (round of play).
Call	To stay in the game by betting money on a dealt hand, especially if it is a potential winning hand.
Call wager	Additional wager with the equal amount of Ante Wager placed to stay in the game.
Dealer	Person responsible for distributing cards and making payouts at a table.
Dealer qualify	Dealer's hand rank of a Queen or Higher to qualify.
fold	To forfeit the Ante Wager. To quit the game for a given hand, particularly for a losing hand.
hand	Display and value of the two random cards the Dealer deals to the Player and himself.
Pair Up wager	Optional wager that a Player can make, side bet, based on an outcome other than the base game. Pair Up payable is a schedule of payouts for the Pair Up wager. Players can lose on the base game and still qualify to be paid on a Pair Up wager.
Player	Person who compares his or her hand against the dealer's to determine the winner.
Push	When the Player's hand is equal to the dealer's qualifying hand, nothing is won or lost and the Player retains all money wagered (other than the Pair Up side bet).
unit	Amount of money wagered. The casino table sets the minimum and maximum values.
wager	To bet; to stay in the game by betting money on a dealt hand, especially if it is a potential winning hand.